REMARKS

Favorable reconsideration of this application is respectfully requested in view of the following remarks.

The subject matter of this application pertains to a parking assist apparatus for performing parking assist control to automatically guide a vehicle to a target parking position, and a method for performing such parking assist control. The background portion of the application points out that known apparatus and method for performing parking assist control estimate the present vehicle position based on the wheel speed detected by a wheel speed sensor, and a yaw rate detected by a yaw rate sensor. If the present vehicle position deviates from a target locus, a wheel steering angle is corrected in response to the amount of deviation from the target locus, thereby correcting the deviation from the target locus.

However, as pointed out in the present application, these known apparatus and method suffer from certain drawbacks in that the present vehicle position monitored during parking assist control is an estimated value based on information from the yaw rate sensor and the wheel speed sensor. When an error or failure occurs, such as a malfunction of the yaw rate sensor, the system may incorrectly recognize that the present vehicle position is on the target locus despite the fact that the estimated present vehicle position and the actual vehicle position are different from one another. In such a situation, the parking assist control is continued as long as the malfunction is not detected and so the vehicle may be guided to an incorrect position different from the target parking position.

The present invention addresses this shortcoming by calculating the change in direction θh of the vehicle based on the output of a speed sensor and a steering

angle sensor, calculating a change in direction θ y of the vehicle based on the output of a yaw rate sensor, and determining whether parking assist control should be stopped based on a comparison of the changes in vehicle direction θ y and θ h. More specifically, as recited in the apparatus claims, the apparatus determines that the parking assist should be stopped when a comparison of the changes in vehicle direction θ y and θ h reveals that the difference between the two is greater than a predetermined value.

Thus, with the method and apparatus at issue here, when a system error occurs, the error can be recognized. For example, if the yaw rate sensor or the steering angle sensor malfunctions, the difference between the turning directions θ h and θ y becomes recognizable. The malfunction can be relatively reliably detected and the vehicle can be prevented from being guided to an inappropriate position different from the target parking position.

U.S. Patent No. 6,898,527 to *Kimura et al.* discloses a parking assist device. As discussed in lines 36-40 of *Kimura et al.*, the focus of the disclosure is to provide a parking assisting device that is capable of accurately guiding a driving operation even when a vehicle is not precisely stopped in a previously set reference position for an initial stop. Generally speaking, *Kimura et al.* discloses a wheel speed sensor 8 for detecting a traveling distance of the vehicle and a yaw rate sensor 2 for detecting an angular speed in a direction of a yaw angle for the vehicle. A controller 1 compares the yaw angle of the vehicle and the value of the calculated turning angle α (= β + δ). *Kimura et al.* describes that the deviation dx1, dx2 of the vehicle from a reference position ST for the initial stop measured by the ultrasonic sensor is

calculated, and the necessary information for rearward parking is provided to the driver via a speaker based on the turning angle and output from the yaw rate sensor.

More specifically, *Kimura et al.* describes that it is difficult to precisely position the vehicle in the reference position ST for the initial stop and so the deviations dx1 and dx2 in the x direction are generated. The distance between the coordinates y1 and y2 shown in Fig. 4 is represented by the distance LD stored in advance in the controller. This makes it possible to obtain the inclination of the vehicle in the initial stop position with respect to the reference position ST for the initial stop based on the deviations dx1 and dx2 and the distance LD.

The controller 1 sets the initial stop position as a position where the yaw angle of the vehicle is zero degree and also activates a program for in-line parking based on the operation of an in-line mode switch 4. The driver steers the steering wheel of the vehicle to the maximum to bring the vehicle to the fully cut state and advances the vehicle in that state. The controller 1 calculates the yaw angle of the vehicle from the angular speed of the vehicle inputted from the yaw rate sensor 2 and compares this yaw angle with the value of the calculated turning angle β. As the vehicle approaches the vehicle position K1 (representing a back start position) from the initial stop position, the controller advises the driver, by way of a speaker 6, of approach information indicating that the vehicle has approached the vehicle position K1 and arrival information indicating that the vehicle has reached the vehicle position K1 based on the difference between the yaw angle and the calculated turning angle β.

The claimed method and apparatus recited in the independent claims differs from the disclosure in *Kimura et al.* in that *Kimura et al.* does not disclose calculation

of a change of a vehicle direction based on the output of a speed sensor and a steering angle sensor, and does not disclose means for calculating a change of vehicle direction based on such outputs. Indeed, nowhere does *Kimura et al.* disclose using the output of a steering angle sensor, together with the output of a speed sensor, to calculate a change of a vehicle direction, and then determining whether parking assist control should be stopped based on a comparison of such change of the vehicle direction with a change of a vehicle direction calculated on the basis of a yaw rate of a yaw rate sensor.

The Official Action states that the discussions in the abstract of *Kimura et al.* and the discussions at the bottom of column 3 and top of column 4, and in lines 30-62 of column 6 describe a steering angle sensor whose output is used to calculate a change in vehicle direction. However, no such disclosure of a steering angle sensor, let alone a steering angle sensor whose output is used to calculate a change in vehicle direction as claimed can be found.

In addition, contrary to the observation in the Official Action, *Kimura et al.* lacks disclosure of a method that involves determining whether parking assist control should be stopped based on a comparison of the changes in vehicle directions calculated in the manner recited in Claim 1. Further, *Kimura et al.* does not disclose that the controller determines that the parking assist should be stopped when a comparison of the changes in vehicle direction reveals that the difference between the two is greater than a predetermined value as set forth in Claims 3 and 9.

It is thus respectfully submitted that the claims at issue here are allowable and such action is earnestly solicited.

Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application the undersigned respectfully requests that he be contacted at the number indicated below.

Respectfully submitted,

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Date: February 16, 2006

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